

Business Model Patterns and Sustainability

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for Master Computer Science

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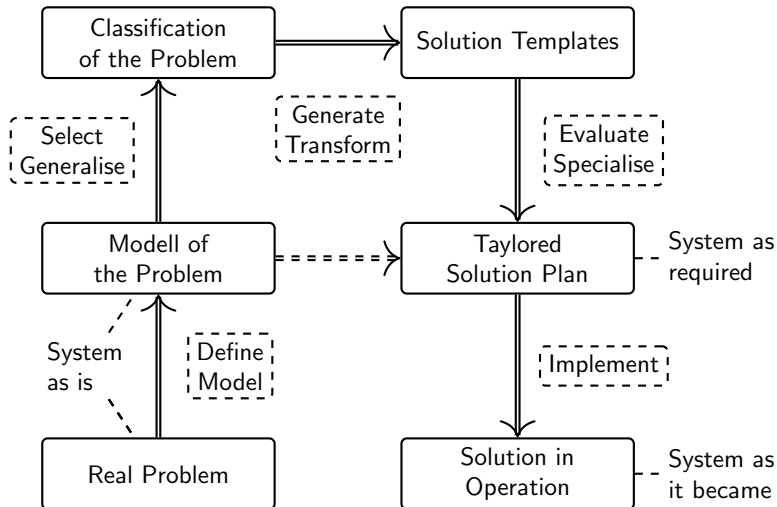
Institutionalisation and Technology

What is Technology?

Technology is an interrelation of

- ▶ globally available *procedural knowledge*,
- ▶ *institutionalised procedures* ("state of the art") and
- ▶ private *procedural skills*.

The TRIZ Way of Thinking



Patterns and Contexts

These forms of institutionalisation are embedded as initially domain-specific patterns in a *domain-specific* methodology, for example as industry sector-specific standards and thus are *contextualised*.

These patterns can be further generalised to cross-domain standards such as the APQC PCF as a Cross-Industry Process Classification Framework.

However, this is also *not universally valid*, but contextualised itself, as it still refers to organisations of a specific-general design.

TRIZ and Patterns

TRIZ is similarly structured. It comes with a toolbox of problem-solving patterns (Select in [Mann])

Inventive principles, Separation Principles, ...

but assumes a specific type of modelling (Define in [Mann]) with

Systemic delimitation, Ideality, Operative Zone, ...

Only on the basis of this (Define) the (Select) is possible.

Development of Business Process Modelling

- ▶ Modelling of work processes (patterns, roles, qualification, ...)
- ▶ Business Process Modelling
- ▶ Business Models (P-TRIZ level according to Howard Smith)

Business Process Models and Business Models

What is a Pattern?

A pattern is a combination of a problem and a corresponding solution that is described in a systematic and generic way, so that it can be used over and over again in different situations.

Sustainability Emerging as Business Goal



Sustainability and Business Models



Triple Bottom Line

A business model for sustainability “helps describing, analyzing, managing, and communicating

- (i) a company’s sustainable value proposition to its customers, and all other stakeholders,
- (ii) how it creates and delivers this value,
- (iii) and how it captures economic value while maintaining or regenerating natural, social, and economic capital beyond its organizational boundaries”.

[Schaltegger et al. 2016]

Sustainability and Business Models

[Lüdeke-Freund et al. 2018]

The authors extraced 45 patterns from the literature on Sustainable Business Models and grouped them into 11 pattern groups.

Example: Pattern group *Pricing & Revenue Patterns*

- ▶ Differential Pricing
- ▶ Freemium
- ▶ Innovative Product Financing
- ▶ Subscription Model

Sustainability and Business Models

Description of *Differential Pricing*

- ▶ *Context:* Base of the Pyramid and low-income groups in both developed and developing countries are often excluded from consumption due to price barriers.
- ▶ *Problem:* Customers might need the same product but have different payment thresholds. Hence, some customers are either unwilling or unable to pay as much as others for the same product.
- ▶ *Solution:* Charging groups with higher payment thresholds higher prices to subsidize those groups who cannot afford to pay as much.
- ▶ *Example:* [Novo Nordisk] sells insulin in developing countries at prices that are up to 20% below the mean prices charged in developed countries.

Sustainability and Business Models

General purpose idea generation tools (including TRIZ – HGG) do not usually show any specific preference to sustainable aspects, since their overall purpose is product success and the identification of unexplored market opportunities. Therefore, the attention to sustainability is random, not taken for granted and presumably dependent on designers' sensibilities towards environmental and human problems. [Russo, Spreafico 2020]

Lifecycle Orientation and Eco Design Principles

[Russo, Spreafico 2020]

General orientation of the *Eco Design Principles* (EDP) approach:

During design phase, each designer is supposed to follow a list of guidelines and accordingly modify the existing product to make it more environmentally friendly. The crucial point is to exploit problem solving strategies as a framework for eco-guidelines that guide the user to make product development, taking into account first of all sustainability objectives.

16 generic strategies are derived, to which the identified 59 Eco Guidelines are assigned.

Lifecycle Orientation and Eco Design Principles

Each of these generic strategies is embedded in the TRIZ methodology and their solving power is outlined *without, however, assigning them to a problem.*

Example: Strategy 2 *Trimming*:

Trimming is a good technique for making greener products. It consists of making a product constituted by fewer parts, with positive consequences on many aspects of the product life cycle, from the management of warehouse orders, storage, transport, as well as on reducing the mass. In order to achieve the maximum environmental benefits, it is preferable to start by eliminating those pieces having the highest impact on the environment. When a component is deleted from the system, it is better to try to exploit the resources already available in the super-system to replace its useful function.

Lifecycle Orientation and Eco Design Principles

The description of each principle is limited to a detailed *Generic Suggestion*, more structured *specific suggestions* and examples.

Similar to [Gassmann et al. 2014], the individual EDPs are also assigned values from a morphological table with the attributes *when, action, what, how*.

- ▶ *When*: Premanufacturing, Manufacturing, Use, End of Life
- ▶ *Action*: Eliminate, Reduce Mass, Reduce Volume, Reduce Quantity, Reduce Distance, Improve Durability, Select Other.
- ▶ *What*: Raw materials, External logistics, Internal logistics, Packaging, Machineries, Auxiliary materials, Components, Emissions, Energy.
- ▶ *How*: Generic suggestion, Resources list, Example.

Lifecycle Orientation and Eco Design Principles

The general pattern of a guideline is formulated as
(WHEN) you want to intervene, (ACT) on components (WHAT), by doing something (HOW) and using one resource (from the Resource list) to find alternatives and assess environmental impacts.

In the paper the following sample of a guideline is given:

*During supply task (WHEN – Premanufacturing),
reduce the mass (ACTION – Reduce mass)
of the raw material (WHAT – Raw material)
by recycling waste material in your facility to make it new raw
material for the product (HOW – Generic Suggestion).
See list of structural resources (HOW – Resources list)
In order to reduce the mass of the casting metal, the casting
channels can be re-used for successive melting (HOW – Exam-
ple)*

Eco Design Principles – A Survey

The authors of [Maccioni et al. 2019] conduct a literature survey on this topic. At the beginning, the difficulties to be overcome are worked out.

Under the heading "Selection of potentially environment-friendly products" four sources with altogether 310 products are analysed. Based on this analysis 66 EDPs are distinguished, giving a short description and assigning them to the examples.

Eco Design Principles – A Survey

Example:

- ▶ *Product:* FRIA refrigerator, Ursula Tischner: fridge built into the external wall to use the winter cold.
- ▶ *Assigned EDPs:*
 - ▶ P16 Minimize energy consumption ginitimize
 - ▶ P18 Select non-toxic and harmless energy resources
 - ▶ P46 Reduce auxiliary components ginitimize
 - ▶ P48 Reduce environmental problems during the product use
 - ▶ P52 Reduce the consumption of energy required
- ▶ *Explanation:* 'It was calculated that in typical German house it could work for about 3–5 months a year without consuming any energy (P16, P46 and P52).' [...]

Summary

The SBM approach seems to be rather counterproductive, as it tries to translate changed consumer behaviour and thus the politicisation of the environmental problem into business models without making visible if this leads to changes in the productive base. In many cases it looks like seeking new *value propositions* to prolongate an old mode of production.

The EDP approach addresses the problem from the material side by taking "planet" and "people" into account at an early stage of product development. It is emphasised that TRIZ is particularly suitable as a methodology here, as it supports both a systemic focus and provides powerful tools for analysing and resolving contradictions.

Nevertheless the application of EDPs might lead to changes in the product perception, boosting or undermining success chances. In the early design phases, the product as a complex whole is not developed enough to assess that appropriately.